# APPLICATION

# FOR

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**TITLE:** SELF-CHECKOUT SYSTEM WITH BIOMETRIC DATA PROCESSING

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# MULTI-DEVICE SUPERVISOR SUPPORT FOR SELF-CHECKOUT SYSTEMS

## CROSS-REFERENCE(S) TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. Patent Application No. 10/364,838 filed February 11, 2003, entitled "Multi-Device Supervisor Support For Self-Checkout Systems," which is a continuation-in-part of U.S. Patent Application No. 10/060,423, filed January 30, 2002, entitled "Multi-Device Supervisor Support For Self-Checkout Systems" each of which claim the benefit of the filing date of U.S. provisional application serial number 60/266,000 which was filed on February 1, 2001.

## BACKGROUND OF THE INVENTION

Over the past few decades, retail point-of-sale ("POS") systems have been greatly automated to expedite the checkout process. Computer-based POS systems are now common in the retail environment. Such systems include one or more checkout terminals (i.e., checkout stations or computerized "cash" registers) and a database of prices, inventory and other information related to the items for purchase. Each checkout station typically includes a bar code scanner which can detect a machine readable bar code on the packaging to identify a scanned item. When an item is scanned, the scanner sends a signal corresponding to the product number of the item to a data processing component of the POS system, which then obtains from the database information relating to the scanned item such as price and description.

More recently, self-checkout systems (such as the U-Scan Express® available from Optimal Robotics Corp.) have come into use. Self-checkout systems include self-checkout stations (each of which typically includes a bar code scanner with an integrated scale) that allow customers to scan bar codes on the items they are purchasing. The checkout station also has other input and output devices (such as an alpha-numeric keypad, a video camera unit and a display). These systems allow customers to directly perform checkout activities such as scanning barcoded items, selecting modes of payment (e.g., credit or debit card), carrying out payment using automated payment accepting means (e.g., credit or debit card readers), and requesting explanations on how to use the checkout station.

The self-checkout station may have a signaling device (e.g., a call button, an "Assist" key on a keypad, a phone, or other device) for use by the customer to request assistance. Assistance may be required when, for example, a non-bar coded item is to be processed. This assistance request may be sent to, and processed at, a supervisory terminal. The supervisory terminal permits a store employee (i.e., a supervisory employee) to perform a range of supervisory activities overseeing and controlling checkout at the self-checkout stations. Supervisory terminal hardware may include, among other things, a video display used to display video images (e.g., from a video camera or other imaging device at a checkout station), a touch screen, a POS keyboard, a PC keyboard, a receipt printer, and a cash drawer.

Supervisory activities include, among others, providing authorization when a customer is purchasing an item not bearing a barcode (such as produce). Prior to making an authorization, the supervisor may make a visual identification of the item and input at a supervisory terminal a code identifying the item. Supervisory activities also include making decisions when the checkout station detects a discrepancy between the actual weight of an

item and the expected weight of that item ("weight violation"). Weight violation activities of the supervisor typically involve either clearing the violation to allow the purchase or removing the item from the order (hereinafter, "voiding the item") and asking the customer to try again. A supervisor may also provide explanations to customers on how to use the checkout station and check out items on behalf of the customer, (such as when the items are too heavy or too large to be scanned by a fixed barcode reader mounted on the checkout station or when the customer seeks assistance for completing the checkout). Additional activities include enabling and disabling operations at the checkout stations, video surveillance of the customer activities, use of a cash drawer to accept cash payment and dispense change, printing a cashier receipt, printing end-of-day, end-of-week and end-of-month reports, and other software or system maintenance activities.

One issue faced by businesses using self-checkout systems is maintaining compliance with sales regulations that imposing age and other restrictions on the purchase of certain items. For example, if a customer tries to purchase alcohol or tobacco, the customer's age must be verified before the purchase is permitted. In a standard point of sale system, this verification is done by a cashier who verifies a customer's identification (e.g., a drivers license) when restricted items are purchased. However, where self-checkout systems are used, verification by a store employee increases labor cost because the store must still rely on store attendants to perform verification. In addition, in environments where an attendant is not always available, verification by a store employee can also lead to lengthy delays for the shopper. Automated verification systems are desired in order to reduce the cost and delays associated with age verification.

United States patent 6,522,722 discloses one implementation of a self-checkout system that includes automated age verification. Generally speaking, what the '722 discloses is a fixed-position self-service checkout terminal that includes a biometric sensor (e.g., a fingerprint sensor) used to receive customer-identifying biometric data. The '722 patent discloses that, when age verification is needed, an identifying code unique to a particular customer (e.g., a store loyalty card number or credit card number) is input by the customer and is used as a key to retrieve a biometric profile associated with that customer. Biometric input data is then input by means of the terminal's biometric sensor. This input data is then compared to data in the biometric profile to verify the identity of the customer. While the '722 patent's age verification system can be beneficial, other automated age verification systems and implementations are still desirable

In some self-checkout systems, a video monitoring system may also be included to help the supervisor oversee customer checkout activities and to assist the customer. A video camera unit at the self-checkout station can be used, e.g., to capture an image of a non-bar coded item for display at the supervisor station. This allows the supervisory employee to view the item and enter the appropriate code.

A number of self-checkout systems are described in, e.g., United States Patent Nos. 5,083,638; 5,115,888; 5,123,494; 5,125,465 and 5,168,961.

## SUMMARY OF THE INVENTION

The present invention provides a self-checkout system. The system includes one or more customer members (i.e., checkout stations), and any number of supervisory members

(i.e., supervisory terminals). Each supervisory terminal is operated to conduct a corresponding set of supervisory activities over operations at the checkout stations.

The supervisory terminal has a network interface for communicating with at least one checkout station through at least one of an electrical medium, a radio frequency (RF) medium and an optical medium. A self-checkout system can support multiple types of supervisory terminals, such as fixed supervisory terminals and mobile supervisory terminals (implemented, e.g., using a hand-held computer coupled to a wireless network). In addition, implementations may include specialized supervisory terminals with limited user input devices. For example, a "pager size" supervisory terminal, small enough to be worn comfortably by a user, can be used to provide an alerting signal to a store employee. The supervisor thus knows when to return to the physical proximity of the system.

Multiple supervisory terminal implementations can be made available to allow the supervisory employee to use a selected supervisory terminal with the highest convenience or utility under a specific set of circumstances. The multiple supervisory terminals can include a stationary supervisory terminal, specialized stationary supervisory terminal, a mobile supervisory terminal, and a compact mobile warning supervisory terminal. Each terminal type can be offered with a variety of different input and display peripherals. For example, the terminals can include keypads, touch screens, still video and motion video input devices, signature capture interfaces, and biometric input devices such as fingerprint sensors. Other biometric devices, such as iris recognition, face recognition, speech or voice recognition, and recognition of other unique physical and behavioral characteristic may also be used.

Different supervisory terminal implementations can provide improved flexibility for providing supervisory activities over the self-checkout system. For example, if a weight

violation occurs at one checkout station while the supervisor is physically located at another checkout station, the supervisor need not walk back to the stationary supervisory terminal to provide supervisory activity. Instead, the supervisor may clear the weight violation by swiping a transponder card in front of a transponder card reader mounted on a specialized stationary terminal located near or on the checkout station. If, at the same time, a different checkout station requires a non-barcoded item approval while the supervisor is still providing support over the weight violation, the supervisor, with line-of-sight view of the non-barcoded item, can e.g., pick up a mobile supervisory terminal from his or her shirt pocket to provide the approval.

A supervisory communications controller can control communications between checkout stations and supervisory terminals to prevent the processing of conflicting supervisory signals (e.g., if different supervisors at different supervisory terminals enter conflicting control over a customer terminal). Similarly, if a customer signature is required, and the self-checkout station being used by the customer does not include an operational signature capture device (either because of device failure or because the station simply lacks signature capture), then a message can be transmitted to one or more mobile stations that do include a signature capture input device and the user can provide the signature at a mobile supervisory terminal.

The ability of the supervisor to choose between multiple supervisory terminals with different physical characteristics allows for quicker response to situations that require supervisor intervention. This can reduce the time spent by the customer at the self-checkout station and the time spent by the supervisor on each order. This coordination of supervisory activities also allows the supervisor to reduce idle time spent watching the system while

stations are not in use. This is achieved by selecting the supervisory terminal which meets the demand of the situation in terms of movement and efficiency of the human-machine interface. For instance, using the mobile warning supervisory terminal, the supervisor may leave the physical proximity of the self-checkout system when customers are not present or when no supervisor activity is needed. This allows for more efficient utilization of supervisory employee resources.

Each supervisory terminal in the self-checkout system may provide a corresponding one of various combinations of mobility and functional completeness with regards to the set of possible supervisory activities. At any point in time, a supervisory employee may choose from among the available supervisory terminals in order to provide a response to situations that require supervisor intervention.

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

## DESCRIPTION OF THE DRAWINGS

Figs. 1 and 2 show block diagrams of self-checkout systems.

Fig. 3 shows a flow chart of a method for providing a mobile supervisory terminal interface.

Fig. 4 shows a flowchart for an automated age verification process.

Fig. 5 shows an exemplary lane selection screen.

Fig. 6 shows an exemplary weight violation screen.

Fig. 7 shows a graphical 14-key keypad.

Figs. 8 shows a flowchart for an identity capture process implemented using a mobile supervisory terminal.

Fig. 9 shows a display screen that may be used as part of the process of Fig. 8.

## DETAILED DESCRIPTION OF THE INVENTION

Self-checkout systems 100 of Fig. 1 and 200 of Fig. 2 can include one or more checkout stations 110-113, 210-213 which are each coupled to multiple supervisory terminals 126-132, 226-232. Each of the supervisory terminals can exert supervisory control over the checkout stations. Terminals 126-132, 226-232 can include small terminals 126-129, 226-229 mounted on or near the checkout station, as well as "full-sized" terminals 130, 230 mobile 131, 231, and pager-sized terminals 132, 232. In some cases, a terminal (e.g., 126-129, 226-229) may have a dedicated function, such as clearing transactions. For example, the terminal 126 may have a transponder-card reader allowing a supervisor to simply swipe a security card to clear a transaction, or a biometric sensor (e.g., a fingerprint sensor) that can be used to implement a customer identification or automated age verification process.

To coordinate the control of the checkout stations by supervisory terminals, and to prevent conflicting control instructions, the control signals exchanged between the checkout stations and supervisory terminals are managed by a supervisory communications controller 122-125, 222. Fig. 1 shows an implementation in which the controller 122-125 is local to each station 110-113, while Fig. 2 shows an implementation in which a centralized controller 222 is used. The local controller 122-125 may be an integrated element of the checkout station's hardware and software system while the controller 222 may be coupled to the

checkout station by a data network (e.g., an Ethernet, Token Ring, or IEEE 802.11b network).

When supervisory control over a checkout station is required, the checkout station's signal processor circuitry 114-117, 214-217 (which may include, e.g., a microprocessor, data storage and other hardware, software, and associated interfaces) generates a supervisory request message that is transmitted to the supervisory communications controller 122-125, 222. The supervisory request message can include data indicating the nature of the requested supervisory assistance. For example, the supervisory request message may include parameters indicating that the message was generated in response to a customer pressing a "Help" button or upon detection of a weight violation at the checkout station. Other supervisory activities may also be reported. The communications controller then distributes the supervisory request message to the supervisory terminals (in some implementations, the message format or contents may be modified and message parameters processed at the communications controller 122-125, 222 prior to such distribution).

Referring now to Fig. 1, the self-checkout system 100 includes both local supervisory terminals 126-129 and shared terminals 230-232. The local terminals 126-129 are directly connected to a corresponding one of the checkout stations 110-113 via the station's local communications controller 122-125, respectively, and can exercise control over the directly connected checkout station. Shared supervisory terminals 130-132 are each coupled to multiple checkout stations and can switch between, and assert control over, the multiple checkout stations 110-113. When a supervisory action is required at a checkout station, e.g., station 110, signals (i.e., data messages) are sent from the station's controller 122 to its local terminal 126 as well as to each of the shared supervisory terminals 130-132. The signal can

be processed at the supervisory terminal to generate an alert informing a supervisor of the need for assistance. The signal may also identify the specific action requested. In some implementations, the controllers 122-125, 222 manage interaction with the multiple supervisory terminals to allow a first reply from a supervisory terminal to be accepted in response to the request for assistance.

Referring now to Fig. 2, as in system 100, the self-checkout system 200 includes both local supervisory terminals 226-229 and shared terminals 230-232. However, in the system 200, coordination of supervisory activities controlling and assisting customer checkout is provided using a common centralized communications controller 222 in place of the multiple local controllers 122-125. The supervisory terminals 226-232 communicate with the checkout stations 210-213 through the central controller 222.

A communications controller 122-125, 222 can communicate a request to supervisory terminals 130-132, 230-232 such that the shared supervisory terminals 130-132 and 230-232 each receive the request. To do so, a "broadcast" request may be used. Alternatively a communications controller 122-125 or 222 may generate and send a unique message to each of the terminals. The controllers 122-125, 222 may also route request to local terminals 126-229, 226-229 such that only the terminal directly connected to the requesting customer station will receive the request. The controller then waits for a response from a supervisory terminal. If responses are generated by multiple supervisory terminals (e.g., if multiple supervisors each attempt to respond), the communications controller will perform an arbitration function to determine the response or responses used to control the checkout station. In one implementation, the controller may simply accept a response from the first responding supervisory terminal. In some cases, additional responses may also be accepted if

they do not conflict with the first response and are still relevant, but will be ignored if the responses are no longer relevant (such as a weight violation that has already been cleared). Alternatively, timeout mechanisms may be used to determine when an outstanding request is no longer relevant. For example, after the first broadcast of a supervisory request message, the controller may re-broadcast the request every 100 milliseconds until a supervisory terminal provides a response. If a supervisory terminal does not receive at least one request from the terminal within a timeout window (e.g., a 500 millisecond window), a time-out will occur. That is, the supervisory terminal will infer that the request was responded to by another supervisory terminal and, therefore, will no longer accept input responsive to the timed-out request (i.e., the request will be removed from a list of outstanding request maintained by the supervisory terminal). In the case of system 100, the supervisory terminals communicate responses directly back to the checkout station's communications controller while in the system 200 responses flow back through the central controller 222.

As an example, a broadcast request message may be distributed to supervisory terminals 126 and 130-132, thereby alerting multiple supervisors of the customer's need for assistance. After the broadcast request is transmitted, the controller 122 will wait for a first one of the supervisory terminals to respond to the request (i.e., to accept the request). In some implementations, upon receiving notice of an accepted broadcast request from a first terminal (e.g., terminal 132), the controller 122 may send a message to non-accepting terminals (e.g., 126, 130-131) canceling the outstanding broadcast request. This prevents an outdated supervisory request from remaining displayed at the non-accepting terminals 126, 130-131. Once a broadcast request is accepted by a terminal, the controller 122 may store data

identifying the accepting supervisory terminal to thereafter manage the flow of data between the customer checkout station 110 and that supervisory terminal.

Supervisory activity over a checkout station can also be initiated at any of the shared supervisory terminals 130-132, 230-232 or at a checkout station's local supervisory terminals 126-129, 226-229. This may be done without the need for a request for supervisory activity from the checkout station. Control of a checkout station may be initiated at a supervisory terminal using a switch, button, software functions or other checkout station selector to select the checkout station under control. For example, Fig. 5, described below, shows an interface allowing selection of one of four checkout lanes (i.e., checkout stations) to be controlled. The supervisory terminal will thereafter initiate contact with the checkout systems to be controlled. In the system 100, the supervisory terminal 130-132 will initiate communication directly with the controller 122-125 of the selected station 110-113. In a centralized controller system 200, the terminal 126-132 will communicate the request to the controller 222 which will thereafter coordinate supervisory activity and will initiate and provide the communication of signals between the supervisory terminal and the corresponding checkout station 210-213. In some implementations, a supervisor may switch between checkout stations being controlled at any point in time using the checkout station selector.

Different controller implementations may use different algorithms, or modes, to distribute and coordinate signals among the supervisory terminals and the checkout stations. In some implementations, all supervisory terminals can be active at the same time. Thus, the supervisory employee can use any one without constraints or delays. Any supervisory terminal can also be disabled to prevent passers-by from making unauthorized or inadvertent use of the system. In addition, the supervisory employee can enable a disabled terminal

before using it. Activation can be explicit, such as by use of a key or entry of a password, or may be implicit, such as by swiping a transponder or magnetic card at a reader on terminal 126-129, 226-229 to void an item.

The supervisory terminals have input devices (e.g., keypads, touch screens, buttons or switches), used by the supervisor to start and stop using the terminal. The input generates corresponding signals to be received by the supervisory communications controllers 122-126, 222 over a communications network 101, 201. In response, the communications controller can either accept input from the supervisory terminal or reject the attempt to connect (the particular response may depend on the current mode of operation). Controller 122-126, 222 and system 100, 200 implementations may support different modes of coordination among the checkout stations and supervisory terminals. Representative modes of coordination include simultaneous, mutually exclusive, preemptive and mixed.

In a simultaneous coordination mode, all supervisory terminals in the self-checkout system 100, 200 may be active for use. Accordingly, there is no specific signal generated when the supervisor decides to switch between them. In a mutually exclusive mode, only one supervisory terminal is active to control a checkout station at a time. Thus, in the mutually exclusive mode, a supervisory terminal can accept and process commands for a checkout station only when no other supervisory terminal is active to control that checkout station. A display or other visual indicator to indicate the state of the terminal as active or inactive can also be included. Preemptive mode is a variation of the mutually exclusive mode. In the preemptive mode, an attempt to activate one supervisory terminal causes the controller 122-126, 222 to attempt to deactivate any currently active supervisory terminal. This attempt may fail (i.e., the controller 122-126, 222 may reject this attempt) if the

currently active supervisory terminal is processing an activity that cannot be interrupted and declines the attempt. A mixed mode is essentially either a mutually exclusive mode or a preemptive mode with the feature that certain other specific supervisory terminals may be allowed to be active simultaneously. For example, a mixed mode may be entered for a compact mobile warning supervisory terminal 132 to warn the supervisor of the beginning of customer activity at a checkout station 110.

Specialized stationary supervisory member 126-129, 226-229 may be provided for circumstances in which the supervisor is, for example, in physical proximity to the checkout station. A supervisor may use terminals 126-129, 226-229 by, e.g., swiping a transponder card in order to authorize a weight violation. Other input devices such as a keypad or keyswitch may also be used in a terminal 126-129, 226-229. In some implementations, for example, in Fig. 1, each terminal 126-129, 226-229 may be dedicated to providing support over a specific checkout station. In other implementations, the terminals 126-129, 226-229 may control multiple checkout stations.

The systems 100, 200 can support a range of supervisory terminal types, each of which may provide different sets of functions. For example, full-function stationary terminals 130, 230, mobile terminals 131, 231, and special-function compact pager-like terminals 132, 232 can be used. The mobile supervisory terminal 131, 231 may be based on a laptop or hand-held, battery-powered computer with a barcode reader, a touch screen, a sound generator and wireless communications capability. A compact mobile warning supervisory terminal 132, 232 may also be provided. The features supported by a particular terminal type can vary depending, e.g., on size, cost, power, convenience, security, or other reasons.

A compact mobile warning supervisory terminal 132, 232 may be implemented using a pager-sized device. A pager-sized terminal 132, 232 is battery powered and communicates wirelessly with the self checkout system via wireless network interface 101, 201. In some cases, each communication controller 122-125, 222 may also have an interface to a standard pager network allowing signals exchanged over a conventional pager network to be used. Terminals 132, 232 may have the ability to display a small string of text, or may include a vibrating or other audio/visual device. e.g., an indication of operations at the self-checkout system. Indications may be generated, e.g., upon use of a checkout station or on request for supervisory activity from a checkout station 110. The pager-sized device may be used, e.g., for general surveillance purposes (e.g., to alert a supervisor of activity when the supervisor is not in physical proximity to a checkout station).

In some implementations, a supervisory terminal may be equipped with a relatively limited selection of interface devices. For example, a mobile or pager-sized device may use the reduced-sized keypad of Fig. 7 rather than a full-sized POS keyboard. In such implementations, the system 100, 200 may provide context-sensitive prompting to support a range of supervisory inputs using the keypad 700. Figs. 3 and 4 illustrate supervisory control processes that can be used to process supervisory inputs using a terminal with a reduced-sized input device.

Figs. 3 and 4 are flow charts showing data processing steps that may be used in implementations of a system 100, 200 to process supervisory data and control checkout stations. The processes 300, 400 are suitable for use with limited display and input capability supervisory terminals. For example, a terminal using a simple touch screen interface may be used. Figs. 5 - 7 show representative touch-screen interface displays that can be used on a

handheld mobile terminal. The processes 300, 400 enable display of supervisory request to, and processing of inputs by, a supervisor, using the displays 500, 600, 700.

The processes 300 is initiated when the supervisory terminal is activated (i.e., when it is turned on). An initial step performed by the terminal is to determine whether intervention of a supervisor is required (step 301). This determination may be made, e.g., based on data exchanged with communication controller 122-126, 222 to determine whether there are any outstanding supervisory request. If intervention is not required, a lane (i.e., checkout station) selection screen 500 may be displayed, allowing the supervisor to initiate control over a checkout station. On the other hand, if supervisory intervention is required, a message requesting intervention is displayed at the supervisory terminals (step 302). The terminal may then display the lane selection screen 500 allowing the supervisor to accept the request or to initiate control of a different terminal (step 303). If there is an outstanding intervention request, a text display area 501 of the screen 500 may display an indication of the request.

If there is an outstanding request, then, using keys 700 on the terminal, the supervisor can either ignore the request, select the lane to be serviced, select an alternative lane to control, or close the program (i.e., reject the request)(step 304). If the supervisor rejects the request (i.e., selects a "close the program" function or reject key) (step 305), a corresponding signal is sent to the controller 122-126, 222 and the terminal is returned to a normal operations mode. In some implementations, the controller 122-126, 222 may route a rejected request to a different one of the supervisory terminals or re-initiate the request.

On the other hand, if the supervisor accepts a request for service from a lane, the terminal determines whether the request relates to a simple transaction, such as a weight violation, that can be displayed and responded to using a fixed display interface, or whether

more complex prompting will be needed (step 306). If, for example, there is a weight violation, a weight violation screen 600 (Fig. 6) is displayed (step 308). The interface 600 may remain displayed until the violation is cleared by the customer or from another supervisory terminal (step 309). Clearing of the violation by another can be determined based on messages exchanged between the terminal and controller 122-126, 222. A supervisory response, including selecting an "Override" or "Later" function, can be entered using interface 600. If "Override" is selected (step 310), a signal is sent to the controller 122-126, 222 to override the weight violation (step 311). If the violation was already cleared or after the supervisor selects "Later" or "Override", processing resumes at step 301. In some implementations, other requests may be processed using simple display screens, such as used for weight violation processing.

If a request does not relate to a simple transaction requiring only simple input (such as a weight violation), a "Tiny Direct Mode" interface, described in pending application 10/060,423, , incorporated herein by referece, may be invoked (step 307). The "Tiny Direct Mode" may use an interface such as that shown in Fig. 7 and may provide for context-sensitive prompting, allowing a range of supervisory functions to be executed using relatively simple input and display devices.

The system 100, 200 can include terminals with a fingerprint sensor (or other biometric sensor) used to implement an automated age verification system. Fig. 4 shows a flowchart for an automated age verification process. During self-checkout, as each item is scanned by the customer (401), the self-checkout system checks a database record associated with the item to determine whether the item is an age restricted item (402). Data identifying

whether an item is age restricted can be stored in the same database as price and other item data.

If the item is not age restricted, normal processing occurs, that is, purchase of the item is allowed (404). If all of the customer's items have been scanned (405), the customer may then complete the transaction (e.g., by entering a credit card for payment) (406). If a scanned item is age restricted, the system will determine whether the customer's age has already been verified, e.g., in connection with the entry of another age restricted item (403). If age verification is needed, the customer is prompted to input his or her date of birth ("DOB") (407). The DOB is used as a key to retrieve all database records with a matching DOB ("candidate records") (408). Each of the candidate records includes data characteristic of a fingerprint ("biometric attribute data").

The system then prompt the customer to place a finger on the fingerprint sensor 502 and, upon the customer doing so, the system will receive data characteristic of the customer's fingerprint ("target biometric data") from the sensor 502 (409). The target biometric data is then compared to the biometric attribute data in each of the candidate records to determine if there is a match (410-411). If there is a match, purchase of the item is allowed (404). If the target biometric data does not match the biometric attribute data in any of candidate records, then exception processing occurs (412).

Exception processing may include, e.g., prompting the shopper to go to a fixed cashier position for id verification, or, in the alternative, alerting store personnel to attend to the shopper using a mobile terminal. After a customer's age is verified by the store attendant and the customer's purchase is approved, the cashier or attendant may scan the customer's fingerprint a second time and confirm that it verifies correctly against the first fingerprint

(i.e., the target biometric data). If the verification is successful, the store attendant can instruct the system 100, 200 to store the target biometric data and customer's DOB in a new database record for use during subsequent purchases. If the cashier is unable to verify the customer's age, (e.g., either the date of birth entered by the shopper does not match the date of birth on the id, or because the id is not valid), the purchase is rejected, and the system directs the cashier to retain the item.

In some implementations, the system allows the customer to refuse to enter a fingerprint in step 409. For example, during the process 409, the system may display text indicating that age verification is needed and may display a button on a touch screen to call a store attendant to assist (e.g., a "Call Attendant To Verify Age" button). If the shopper refuses to enter a fingerprint in step 409, exception processing 412 (i.e., manual verification) takes place. If the customer is hesitant to input fingerprint data during exception processing 412, then creation of a new database record storing such data will not occur.

In some implementations, the DOB / biometric attribute records (i.e., the "candidate records") store only the date of birth and biometric attribute data, while in other systems, additional data can be included. In the above-described implementation, it is not necessary for the system to store additional customer identification data (e.g., name, address, and other identifying data) for the age verification process. Age verification can be performed merely by comparing target biometric data to biometric attribute data in a group of candidate records (all of which are retrieved using the same DOB key). This feature may help alleviate customer security and privacy concerns.

In addition, the system 100, 200 can include terminals that can automatically capture identification information, such as a signature. Fig. 8 shows a data flow for a identity capture

process implemented using a mobile supervisory terminal. The process 800 may be used, e.g., to complete a credit payment transaction requiring capture of a customer's signature or other customer identification. The process 800 may be initiated after the customer has self-checked items for purchase and has indicated that that payment for a purchase is to be made using a credit account.

The process 800 begins with the receipt of a supervisory request message at a mobile terminal. Steps 301-305 of Fig. 8 are directed to a lane selection operation and may be implemented in a manner that is substantially identical to that described with respect to steps 301-305 of Fig. 3. Following lane selection, the terminal determines whether the supervisory request message is related to identification capture (step 806). If the request was not for an identification capture, the terminal will proceed with other appropriate processing (step 807). For example, if appropriate, the terminal may proceed at the processing step 306 of Fig. 3.

If a supervisory request is for an identification capture, an appropriate display or control interface is displayed (step 808). In the case of a signature capture, the interface may resemble the interface screen 900 of Fig. 9. The interface 900 allows a user to input a signature by writing on a touch-sensitive display screen. In the case of a video image identification, the terminal may include an miniature integrated video camera and the display screen may be a window showing a preview of a captured image. In the case of a fingerprint capture terminal, the interface may instruct a user to place a finger on a fingerprint sensor integrated with the terminal. Still other interfaces may be used.

If the customer identification data is successfully captured (e.g., as indicated by selecting the "O.K." button 901), the data can be returned to the store controller or the self checkout station (step 809-810). Upon successful receipt of the identification data, the

controller may complete processing of the credit transaction and store the captured identification data in a database for future verification purposes (i.e., as proof of customer authorization). On the other hand, if the identification data was not successfully captured (e.g., due to a timeout or selection of the "cancel" button 902) (step 809, 811), a capture failure message is returned to the controller. The controller may then perform exception processing, such as requesting a different form of payment from the customer, displaying an alert message on a supervisory terminal, or re-initiating a capture operation at a different supervisory terminal.

Various changes and modifications to the processes 300, 400, 800 may be made. For example, the interface may return in all cases to accept more input instead of returning to normal operations, except when "Cancel" is pressed. Display of the weight violation screen 600 may be replaced by entry into the simplified supervisory mode 400 in a weight violation context. Thus, pressing "Enter" would authorize the scanned item and pressing "Cancel" would cause the mobile supervisory terminal interface to exit the simplified supervisory mode and to return to normal interface operation.

Various hardware and software components can be used to implement the systems 100, 200 and the claimed inventions. The invention may be implemented in digital electronic circuitry, or in computer hardware, firmware, software, or in combinations of them. Apparatus of the invention may be implemented in a computer program product tangibly embodied in a machine-readable storage device for execution by a programmable processor; and method steps of the invention may be performed by a programmable processor executing a program of instructions to perform functions of the invention by operating on input data and generating output. The invention may advantageously be implemented in one or more

computer programs that are executable on a programmable system including at least one programmable processor coupled to receive data and instructions from, and to transmit data and instructions to, a data storage system, at least one input device, and at least one output device. Each computer program may be implemented in a high-level procedural or object-oriented programming language, or in assembly or machine language if desired; and in any case, the language may be a compiled or interpreted language. Suitable processors include, by way of example, both general and special purpose microprocessors. Generally, a processor will receive instructions and data from a read-only memory and/or a random access memory. Storage devices suitable for tangibly embodying computer program instructions, databases, and other data include all forms of non-volatile memory, including by way of example semiconductor memory devices, such as EPROM, EEPROM, and flash memory devices; magnetic disks such as internal hard disks and removable disks; magneto-optical disks; and CD-ROM disks. The term "database" should be read broadly and includes both data stored on a hard disk drive or other permanent media, as well as data structures stored in volatile memory. Any of the foregoing may be supplemented by, or incorporated in, specially-designed ASICs (application-specific integrated circuits).

A number of embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. For example, network interfaces 101, 201 connecting controller 122-126, 222 to supervisory terminals may use standard networks, such as Ethernet and IEEE 802.11b data networks, as well as proprietary networks and may also include multiple network types. Thus, other wired and/or wireless electrical connections (e.g. infrared, radio frequency, and others) and chip-level connections can be used. The

controllers therefore, may have a number of connections of different types to accommodate all of the communication protocols among the supervisory terminals. Steps of processes 300, 400, 1000 may be performed in different orders, additional steps may be added, or some removed. For example, in process 400, step 409 may occur before step 408. Further, although an implementation of the system is described as using biometric information for self-checkout of age restricted items, implementations may also use biometric information to determine whether other types of restricted purchases may take place. For example, biometric customer identification may be used for purchase of restricted pharmaceuticals. Accordingly, other embodiments are within the scope of the claims.